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Cotton Swab Used for Cosmetic or Medical Purposes or For Body Care

The invention concerns a cotton swab for cosmetic or medical purposes or for body care, comprising a stick, at least one end of which is provided with a fiber material forming a cotton head. Cosmetic or medical cotton swabs of this type serve to clean, remove make-up or apply cosmetic products or in the medical field, to clean wounds or apply ointments.

There are a plurality of conventional cotton swabs of this type. EP 0 402 140 B1 discloses a cotton pad comprising a cotton head of lipophilic polyolefin microfibers. The term microfibers is largely undefined.

EP 0 363 533 A1 describes a cotton swab whose fiber material comprises cotton fibers and thermally meltable bi-component fibers whose portion is defined, by way of example, to be at least 10 weight %. This document does not provide any further information.

DE 101 23 971 C2 discloses a cleaning stick for cleaning electrical or electromechanical components. It has a pointed end which is surrounded by a piece of cloth, following the conical shape of the stick, to thereby produce a sealed conical end on a cleaning stick. The material may be a woven polyester or, alternatively, a polyester nylon microfiber material.

US 4,100,324 describes a fiber mixture of wood pulp fibers and thermoplastic microfibers having an average fiber diameter of less than 10µm. Due to the fact that this fiber mixture is essentially produced simultaneously with spinning of the microfibers by introducing an air flow and a pulp fiber flow into the region of the spinning head for the microfibers, the fibers are connected and the microfibers fix the pulp

fibers in a state in which the microfibers are still at increased temperatures and not yet solidified. The microfibers therefore have a matrix-forming effect on the wood pulp fibers, and embed the wood pulp fibers in a hinged, i.e. non-rigid, manner even for very small microfiber content of down to 1 weight %. Further fibers or particulate material may be introduced, including synthetic fibers such as nylon fibers or natural fibers such as cotton, flax, jute and silk.

Due to the production of the fiber mixture substantially in situ together with formation of microfibers using the melt blown method, the microfibers lose their independence in the fiber product and are modified and fixed while soft by means of the contact to the wood pulp fibers. They can no longer be used as an individual fiber component or as fiber type for producing a product i.e. for introduction into a production process.

In accordance with the teaching of US 4,100,324, the combined flow of melt blown microfibers and wood pulp fibers is introduced into a gap between two vacuum rollers and formed into a fleece having a very high weight per unit area of 50g/m^2 to nearly 200 g/m^2. The fiber mixture has attained its final fleece shape directly following fleece formation. Subsequent fraying out, i.e. separation of the fibers is no longer possible.

There are conventional cotton swabs having a cotton head which consists of 100% cotton fibers.

It is the underlying purpose of the present invention to improve a cotton swab of the above-mentioned type such that it feels softer without considerably reducing the stability of the cotton head. Moreover, the cleaning effect should be improved compared to swabs of 100% cotton.

This object is achieved with a cotton swab in accordance with the invention in that the fiber material comprises micro staple fibers having a length of at least 7mm.

The term micro staple fibers used above means synthetic fibers of a fiber strength of ≤1 dtex. The term micro staple fibers thereby means that microfibers of a defined length or defined length range are used for producing the fiber fleece layer or a band or cord-shaped fiber fleece for the cotton head at the free ends of the cotton swabs, the fibers having been previously formed in a separate production method. These separated staple fibers are then deposited to form the fiber material. Fibers formed by spinning fleece or melt blown methods, with (see US 4,100,342) the fiber forming and fleece forming processes being essentially carried out in one step, are not used. On the contrary, microfibers of a certain length or of a certain length region (>7mm) are used which are formed in a production method which is separate from the fleece forming process. It has turned out that synthetic micro staple fibers can provide a cotton swab or the cotton head of a cotton swab with more softness and therefore with an excellent haptic effect for the user while surprisingly not reducing the cleaning or make-up removing effect or the solidity of the cotton head. In fact, inventive cotton swabs having micro staple fibers of a length of at least 7mm actually have superior cleaning and make-up removing effect and are better suited to e.g. remove fat-containing dirt from the ear than are cotton swabs which consist of 100% cotton fibers.

Due to the fineness of the micro staple fibers, the available surface of the fiber material which can come into contact with the skin surface to be cleaned, is also larger compared to pure cotton swabs. This large surface therefore also delimits a large number of microgaps and openings which

may serve to receive impurities, skin particles, fat-containing dirt or make-up.

The length of the micro staple fibers which can be used is preferably 10 to 38mm, in particular, 15 to 32mm.

In a further embodiment of the invention, the micro staple fibers may be polyester (PES) or viscose fibers.

The portion of micro staple fibers relative to the mass of the fiber material is preferably 3 to 50 weight %, in particular 5 to 30 weight % and most preferably 5 to 20 weight %.

The fiber material may additionally advantageously comprise up to 97 weight %, in particular 60 to 97 weight % and preferably 70 to 95 weight % of cotton fibers. Cotton fibers are advantageously included, in particular, when the cotton swab should be suited to receive a face-cleaning solution or to remove make-up using a make-up removing agent having a high liquid portion. Cotton noils are preferably used as cotton fibers.

To produce the inventive cotton swab, the synthetic micro staple fibers produced in a separate process are deposited to form fleece in accordance with conventional fleece formation methods. If different fiber types are used, these are preferably previously mixed in an air flow and then deposited. If additional thermally meltable binding fibers are present, the fleece may be thermally fixed in an "air-through-method" with a precisely adjustable gas temperature, thereby preferably preventing thermal and thereby structural influence or impairment of the synthetic micro staple fibers.

In order to obtain a high internal solidity of the fiber material in the cotton head, the fiber material advantageously comprises thermally meltable binding fibers. The portion of thermally meltable binding fibers compared to the mass of fiber material is, in particular, 5 to 20 weight % and preferably 5 to 15 weight %.

In a further embodiment of the invention, the binding fibers may be multi-component fibers, in particular, bi-component fibers, having a carrier component which melts at higher temperatures and a binding component which melts at lower temperatures.

The multi-component fibers, in particular, bi-component fibers advantageously have a fiber thickness of 1.3 to 10 dtex, in particular 1.3 to 3 dtex and a fiber length of 3 to 60mm. Advantageously core/jacket fibers or side-to side fibers are used.

Bi-component fibers having a copolyester (CO-PES) as low melting component and polyester (PES) as higher melting component have turned out to be advantageous.

In one particularly important further embodiment of the invention, the melting point of the thermally meltable binding fibers or the low melting component (e.g. CO-PES) of the multi-component fibers is lower than the melting point of the micro staple fibers. Micro staple fibers of polyester material may e.g. be used having a melting point of approximately 256°C and CP-PES/PES bi-component fibers having a melting point of the low melting component CP-PES of 110°C and of the higher melting component PES of 255°C. In this case, the fiber fleece may be thermally solidified to produce the cotton head without thermally changing the higher melting component of the bi-component fibers and the micro staple fibers.

In a further particularly important embodiment of the invention, the removing resistance of the fiber material forming the cotton head which represents a measure for the binding of the fiber material to the free end of the stick and also for the fiber adhesion, is at least 30 N, preferably at least 40 N, as measured in accordance with the following removal test.

Removal test:

The removal resistance or the peeling-off resistance of a cotton head during removal from the free end of the stick of a cosmetic or medical cotton swab is determined using the following removal test. Towards this end, a sample holder 2 (Fig. 1) and a tensile testing device 3 (Fig. 2) according to DIN 51221 are used. The sample holder 2 comprises a holding block 4 with a bore 6 whose diameter is slightly larger than the outer diameter of the stick 8 of the cotton swab. The diameter of the bore 6 is thereby 3 to 5% larger than the outer diameter of the stick 8 of the cotton swab such that even with a tolerance for the outer diameter of the stick of ±3%, the stick region of the cotton swab can still be slidably reciprocated in the bore, substantially without resistance. To carry out the test, the cotton head is separated from a cotton swab on the side which is not tested and this free end of the cotton swab is inserted through the bore 6 of the holding block 4. The sample holder 2 comprising the swab to be tested is clamped in the tensile testing device 3 (Fig. 2). The free end 10 of the cotton swab which is disposed through the sample holder 2 is thereby fixed in the lower clamp 12 of the tensile testing device 3 (Fig. 2). The sample holder 2 itself is fixed in the upper clamp 14 of the tensile testing device. The tensile testing device is adjusted such that the clamps 12, 14 move apart with a testing speed of 300mm/min, wherein the upper clamp 14 is moved away from the stationary lower clamp 12 at the testing speed, as shown. The testing

force which acts between the clamps is thereby measured. The maximum tensile force determined during testing is rounded off to a decimal and stated in Newtons. Each test terminates by shearing the stick 8 of the cotton swab from the cotton head 16 and pulling it through the bore 6 of the holding block 4 of the sample holder 2.

In order to optimize absorption capacity, the fiber material of the inventive cotton swab advantageously has a sinking duration in an aqueous solution of at least 3 sec., preferably at least 3.4 sec., with particular preference at least 4 sec., and optimally at least 4.5 sec.

It is also advantageous if the water retaining capacity of the fiber material in accordance with the presently described absorption capacity test is at least 21 g/g, and preferably at least 23 g/g.

Both tests are carried out on the fiber material in the disposed state in which it can be directly used to produce the cotton head.

The more hydrophilic the overall fiber material is, the faster it sinks in the aqueous liquid. This is desirable only to a limited degree, in particular for cleaning fatty skin surfaces. It has turned out that fiber materials comprising microfibers having a sinking duration of more than 3 sec. achieve a much better cleaning effect than pure cotton fiber materials. This does not mean that a slightly higher sinking duration necessarily entails a worse water retaining capacity. The inventive cotton swabs of higher softness achieve higher absorption capacities or at least as good a water retaining capacity as pure cotton swabs, whose water retaining capacity is below 22.5 g/g in the test described below.

Sinking duration test and absorption capacity test:

The following test is described in PH.EUR.1997, Monografie Verbandwatte aus Baumwolle. It is a test for absorption capacity by determining the sinking duration of a wire basked filled with fiber material in a liquid and the water retaining capacity. The wire basked used in this case, is a cylindrical basket of copper wire with a wire diameter of 0.4mm. The height is 80mm, the diameter is 50mm, the mesh width is 15-20mm and the mass is 2.7 +/- 0.3g. A glass having a diameter of 11-12cm is used.

A test amount of 5g of fiber material in the form of a deposited fleece is placed into the wire basked. The basket is previously weighed with an accuracy of 0.01g (M1). The 5 g of specimen material constitute the mass M2. The glass is filled with demineralized water to a level of approximately 100mm and the filled basket is dropped onto the water from a height of 10mm. The time needed to sink below the surface, i.e. the sinking time, is measured with a stop watch. Directly after determination of the sinking time, the basket is lifted out of the water and is horizontally held along its longitudinal axis for 30s of dripping. After elapse of the dripping time, the basket is put into a counterbalanced beaker (M3) and weighed with an accuracy of 0.01 g (M4).

The water retaining capacity is given by

$$g/g = \frac{M4-(M2+M3)}{M2-M1}$$

The sinking time and the water retaining capacity are given as an average value of three measurements. The sinking time of preferred fiber material for the production of cotton swabs is at least 3 seconds and the water retaining capacity is at least 21 g/g. This can be obtained through

selection of the portion of absorbing fibers and/or through the addition of hydrophiliation agents.

In a further embodiment of the invention, the fiber material advantageously contains softener, preferably in an amount of at least 0.2 weight % of the mass of the fiber material. The softeners are preferably used for treating added cotton fibers. Softeners may be used which comprise a fatty acid condensation product and/or functional polydimethyl siloxanes and/or polyethylenes.

Particularly good qualities of the inventive cotton swab are obtained if its fiber material forming the cotton head is produced from a fiber fleece strip or a fiber fleece cord of a specific weight of 0.5 to 8 g/m, in particular 1 to 2 g/m. The fiber fleece thereby preferably has a width of 10-20mm, in particular 12-18mm. The cord-shaped or strip-shaped section of the fiber fleece supplied during the production process is thereby very thin and is preferably also very narrow and is moreover extremely well-suited to be wrapped around the free end of the stick and be mounted thereto in a conventional manner.

In a particularly advantageous manner, the fiber fleece or the fiber fleece strip for producing the cotton head is a card fleece which is oriented in the machine direction. This produces high tensile strength in the cord or strip-shaped fiber fleece which facilitates production of the cotton head at the free end of the stick.

Further features, details and advantages of the invention can be extracted from the following claims and the drawing and the following description of a preferred embodiment of the invention.

Fig. 1 shows a perspective view of a sample holder for a cotton swab for carrying out the removal test;

Fig. 2 shows a schematic view of the tensile testing device for carrying out the removing test; and

Fig. 3 shows a view of a cosmetic cotton swab.

Figs. 1 and 2 were explained above.

Fig. 3 shows a typical cosmetic cotton swab 20 with a stick 22 and a cotton head 24, at both ends of the stick 22, made from a fiber material having micro staple fibers of a length of at least 7mm and a fiber thickness of ≤1 dtex.

A preferred composition of the fiber material comprises 3 to 50 weight %, in particular 5 to 30 weight % and preferably 5 to 20 weight % of micro staple fibers 0.9 dtex thick. Moreover, the fiber material comprises up to 97 weight %, in particular 60 to 95 and preferably 70 to 95 weight % of cotton. The above-mentioned microfibers are polyester or viscose fibers of 18 to 38mm in length.

In accordance with a particularly preferred embodiment, the fiber material comprises 90 weight % of cotton fibers, preferably cotton noils and 10 weight % micro staple fibers. To form a cotton head, approximately 0.02 to 0.3 g, in particular 0.02 to 0.05g fiber material is used. The head diameter, measured transversely to the longitudinal direction of the stick is 3 to 12mm, in particular 3.5 to 5.5mm.

The head length, measured in the longitudinal direction of the stick is 10 to 35mm, in particular 11 to 16mm. The stick diameter is approximately 2.4 to 5.5mm.

The following table shows measured values of the sinking duration test and absorption capacity test (water retaining capacity), wherein four samples of a mixture of 10 weight % polyester microfibers 0.9 dtex thick and 90 weight % of cotton fibers and three samples of a mixture of 25 weight % polyester microfibers 0.9 dtex thick and 75 weight % cotton fibers were tested and compared with a sample of a 100% cotton fiber cotton cord. Addition of 10% micro staple fibers already increases the softness thereby increasing the sinking duration and the water retaining capacity.

Test features	unit	Cotton cord of 100% cotton noils	Cotton cord of 90% cotton noils / 10% micro fibers				Cotton cord of 75% cotton noils / 25% micro fibers		
			Sample 1	Sample 2	Sample 3	Sample 4	Sample 1	Sample 2	Sample 3
Sinking time	Sec	3.02 2.95 2.95 3.16 2.90	3.75 3.70 3.31 3.52 3.64	4.33 3.56 3.56 3.72 3.49	3.58 3.04 3.96 3.36 3.14	3.70 3.79 3.71 3.64 2.99	5.33 4.97 5.14 4.92 4.84	4.78 4.24 5.47 4.95 5.08	4.52 4.71 4.34 5.05 5.34
x / s		3.0/0.1	3.6/0.2	3.8/0.3	3.4/0.4	3.6/0.3	5.0/0.2	4.9/0.4	4.8/0.4
Water retaining capacity	g/g	21.9 22.4 21.3 22.7 22.0	24.4 24.7 23.1 23.4 25.2	22.7 23.6 22.3 22.8 23.1	22.3 19.6 22.6 22.0 21.3	22.4 21.7 23.0 23.4 21.6	25.1 26.1 25.1 24.2 26.4	25.6 23.1 26.0 24.8 26.0	24.2 25.8 23.8 25.3 26.3
x / s		22/0.5	24.2/0.9	22.9/0.5	21.6/1.2	22.4/0.8	25/0.9	25/1.2	25/1.1

x arithmetic average
s standard deviation